SN 10/606,275
Amendment; Response to Office Action mailed March 14, 2005;
and Petition for Extension of Time

AMENDMENT TO THE SPECIFICATION

Please replace the paragraph beginning on page 18, line 20, with the following:

The process of the invention is intended to be executed in a calculator which is represented on Figure 1 as a computer 4 having programmable processing means such as a microprocessor, memories for data and program, input and output channels to related devices such as a keyboard, mouse, disk storage, and a display. ~~display...~~ The calculator is functioning according to a program which is stored in its memory and which has been represented as instructions in box 3 on the right of Figure 1. This program may have been introduced in the calculator thanks to a readable media represented as a floppy disk 5 in Figure 1. Other type of readable media may be used to carry (bear) the instructions of the program controlling the calculator. A problem has been introduced in the calculator as represented in box 1 on the right, in this example, by a map of the western part of Europe for the determination of colors to use between countries. The problem has been modeled with constrained discrete variables in the form of a graph (lists of data in the memory of the calculator) in box 2. The program being executed, results are displayed on the display output device as a list of colors to use for each country.

Please replace the paragraph beginning on page 20, line 23, with the following:

Fig. [[2a]] 3a gives the interaction graph for a simple problem of graph coloring with four nodes. Each constraint connects exactly two variables. If the variables can take three colors, blue red and green, the truth table is the same for each constraint. For a constraint connecting variables x and y, the truth table is (Yes means that the constraint is satisfied):

Variable x	Variable y	Constraint
Blue	Blue	No
Blue	Red	Yes
Blue	Green	Yes
Red	Blue	Yes
Red	Red	No
Red	Green	Yes

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Green	Blue	Yes
Green	Red	Yes
Green	Green	No

Please replace the paragraph beginning on page 23, line 9, with the following:

For instance, considering the coloring problem of Figure 3a with three colors, blue, red and green. A cavity-field sent from the variable z to the constraint b consists of three boxes (one for each color). In each such box, it contains the number of warnings which are received by variable z from the constraints c and d. This number can be either 0, 1 or 2 (For instance if the cavity bias sent from c to z is a warning not to be green, and the warning sent from d to z is a warning not to be blue, the cavity-field sent from z to b contains a one in the blue box, a zero in the red box, and a one in the green box). The cavity-field from z to b is determined from two cavity-biases (c to z and d to z); each cavity-bias contains at most one warning (because of the nature of the coloring problem; therefore the sum of the integers in each of the three boxes of the cavity-field sent from z [[to]] is less or equal to 2: the possible cavity-fields from z to b are (0,0,0), (1,0,0), (0,1,0), (0,0,1), (2,0,0), (0,2,0), (0,0,2), (1,1,0), (1,0,1), (0,1,1), where the first number is the number of warnings in the blue box, the second is the number of warnings in the red box, and the third number is the number of warnings in the green box. The cavity-field survey sent from z to b is the probability of each one of these ten cavity-fields: it is given by ten real numbers in [0,1], the sum of which is equal to one.

Please replace the paragraph beginning on page 29, line 30, with the following:

It is possible to pick up the variable with the largest degree of polarization (or one of them randomly if several of them have the same largest degree), or to pick up at random one of the variables in the best n percent of variables, as measured from the degree of polarization. It is also possible to fix simultaneously several variables. These variants of the procedure depend on [[ho]] how difficult the problem is: in relatively easy problems, it is faster to fix a certain fraction of the variables at each iteration of the survey inspired decimation, while in more difficult problems one should fix one variable at a time. The variables are assigned to their preferred value (the one giving the largest probability of having zero warning). Once the strongly

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polarized variables have been assigned a value, the truth tables of all the constraints to which they are connected are restricted. Some of the constraints may disappear in this process. This way, a new problem with fewer variables, on which the Survey Propagation procedure can be started again, is obtained.

Please replace the paragraph beginning on page 33, line 18, with the following:

Similarly, the cavity-bias-survey $e \rightarrow S_2$ is a collection of four positive numbers $q_{(0,0)}$, $q_{(1,0)}$, $q_{(0,1)}$ [[et]] and $q_{(1,1)}$ whose sum is equal to one.

Please replace the paragraph beginning on page 36, line 17, with the following:

The program which has been used allows selection of functioning parameters such as the way updates along the graph are done, either by lazy convergence or sequentially, or such as the maximum number of iterations until convergence. The main steps of this program are summarized in Figure 6 flow ~~chard~~ chart in which a penalty function can be used. As input (input box at the top), the convergence criterion (ε) and polarization criterion (ε') are inputted with the maximum number of iterations cycles (NMAX) and the list of constraints in relation to the variables. During this input step, the penalty amount y for a penalty function is initialized to an infinite value. A next step, second box from the top, is for the preparation of the data which will be processed. During this preparation step, the list of constraints in relation to the variable is read as to built-up a list of edges of the graph and look-up tables of constraints. The next step is for initialization, third box from the top, in which the cavity-bias-surveys are initialized at random and a computation variable for the number of updates cycles, Nupdate, initialized to zero. Then, the survey propagation is processed, survey propagation box, with, for each edge of the graph, updates of the cavity-bias-surveys, increment of Nupdate and the estimation of the maximal difference d between cavity-bias-surveys before and after the current update cycle. After this last step of survey propagation, a first test is done on the number of updates cycles, Nupdate: if Nupdate is greater than NMAX, the maximum number of iteration cycles then y (penalty) is decreased and the program goes back to the initialization step. If this is not the case, a second test is done on the maximal difference d, if the maximal difference is greater than the

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convergence criterion, the program goes back to the survey propagation step again. If this is not the case, the next step after those two (negative) tests are for choosing a variable to fix in which local-fields-surveys are computed and the degree of polarization B_i of each variable Bi computed. Then a test is done on the degree of polarization: if all the absolute values of differences are lower the polarization criterion, a local search procedure is initiated after output of lists of assigned variables and remaining constraints. If not, the survey inspired decimation step is started, before last box, in which the variable X_i with the largest degree of polarization B_i is assigned, the constraints involving X_i simplified and the number N_a of assigned variables computed. A last test is then done in which if all the variables are not assigned, that is Na < N, with N <u>representing</u> the total number of variables, the program goes back to the survey propagation step. If this is not the case, that is all variables <u>are</u> assigned, the results of the assignments of all the variables are outputted.